Abstract

An improved system and method is provided for packet routing in dynamic router tables. Specifically, the invention relates to a method and system for using tree data structures to select the highest priority rule that matches a destination address in dynamic Internet packet routing tables. In an embodiment, a data structure called BOB (binary tree on binary tree) for dynamic router tables in which the rule filters are nonintersecting ranges and in which ties are broken by selecting the highest-priority rule that matches a destination address is disclosed. Prefix filters are a special case of nonintersecting ranges and the commonly used longest-prefix tie breaker is a special case of the highest-priority tie breaker. When an n-rule router table is represented using BOB, the highest-priority rule that matches a destination address may be found in $O(\log^2 n)$ time; a new rule may be inserted and an old one deleted in $O(\log n)$ time. For the case when all rule filters are prefixes, the data structure PBOB (prefix BOB) permits highest-priority matching as well as rule insertion and deletion in $O(W)$ time, where W is the length of the longest prefix, each. When all rule filters are prefixes and longest-prefix matching is to be done, the data structures LMPBOB (longest matching-prefix BOB) permits longest-prefix matching in $O(W)$ time; rule insertion and deletion each take $O(\log n)$ time. On practical rule tables, BOB and PBOB perform each of the three dynamic-table operations in $O(\log n)$ time and with $O(\log n)$ cache misses. The number of cache misses incurred by LMPBOB is also $O(\log n)$.